



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/066,627	02/06/2002	Hitoshi Kato	33082M119	4442

441 7590 04/26/2004

SMITH, GAMBRELL & RUSSELL, LLP  
1850 M STREET, N.W., SUITE 800  
WASHINGTON, DC 20036

EXAMINER

GUERRERO, MARIA F

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 04/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

ms

<b>Office Action Summary</b>	<b>Application No.</b>		<b>Applicant(s)</b>	
	10/066,627		KATO ET AL.	
	<b>Examiner</b>		<b>Art Unit</b>	
	Maria Guerrero		2822	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 February 2004.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-12 is/are pending in the application.  
     4a) Of the above claim(s) 1-6 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 7-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

1. This Office Action is in response to the Amendment filed February 3, 2004.

Claims 1-12 are pending.

### *Election/Restrictions*

2. Applicant's election of Species II (claims 7-12) in Paper No. 4 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claims 1-6 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 4.

### *Priority*

3. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 7-8 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over R.C. Taylor et al. "LPCVD of Silicon Nitride Films From Hexachlorodisilane and Ammonia" in view of Mizuno et al. (U.S. 6,486,083) and Applicant admitted prior art.

5. Taylor et al. shows supplying hexachlorodisilane and ammonia to a reaction vessel to form a silicon nitride film on a work piece. Taylor et al. teaches employing an inert gas ( $N_2$ ) during the process, producing a Si-N-H compound, and heating the reactor chamber at a temperature in the range of 450 to 850°C. (pages 319-323).

Regarding claims 7-8 and 11-12, Taylor et al. does not specifically show discharging ammonia from the reaction vessel into the exhaust pipe to pre-clean the inside of the exhaust pipe. However, Mizuno et al. teaches that the exhaust pipe is necessarily present on Taylor et al. process (col. 5, lines 15-43). Mizuno et al. discloses discharging ammonia from the reaction vessel into the exhaust pipe after depositing the silicon nitride (pre-cleaning) (col. 5, lines 45-67). Mizuno et al. also shows supplying an inert gas ( $N_2$ ) after and before supplying the ammonia (col. 5, lines 55-67, col. 6, lines 1-15).

Taylor et al. does not expressly show the Si-Cl-N-H compound remaining in the exhaust pipe. However, this could be inferred from Taylor et al. process. In addition, Applicant admitted prior art teaches, as well known in the art, when hexachlorodisilane and ammonia react produced the Si-Cl-N-H compound as an intermediate product (page 2). Applicant admitted prior art also shows that the exhaust pipe is necessarily present on Taylor et al. process (page 1, Fig. 6).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Taylor et al. reference by including the step of discharging ammonia from the reaction vessel into the exhaust pipe as taught Mizuno et al. and recognize that the Si-Cl-N-H compound is formed in Taylor et al. process as

taught Applicant admitted prior art. The modification is proper because Taylor et al. disclosed increasing the ammonia flow rate (Taylor et al., Fig. 2). The modification would provide a silicon nitride film having better uniformity and a process having less contamination on the final product, which is one of the objectives of Taylor et al. (Mizuno et al. col. 2, lines 28-29; Taylor et al., Fig. 2, Abstract).

6. Claim 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over R.C. Taylor et al. Mizuno et al., and Applicant admitted prior art (U.S. 6,486,083) as applied to claims 7-8 and 11-12 above, and further in view of Saito et al. (U.S. 6,159,298).

Regarding claims 9-10, the combination of R.C. Taylor et al. and Mizuno et al. (U.S. 6,486,083) does not specifically show heating the exhaust pipe at 100° C. or above and set the pressure in the range of 665 to 66500 Pa. However, Saito et al. teaches heating the exhaust pipe at 150° C. and employing a pressure of 5 torr (665 Pa) (col. 5, lines 60-65, col. 8, 1-3).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of R.C. Taylor et al., Mizuno et al., and Applicant admitted prior art by including the step of heating the exhaust pipe as taught Saito et al. in order to avoid adhesion of any by-products.

### ***Response to Arguments***

7. Applicant's arguments filed February 3, 2004 have been fully considered but they are not persuasive. Claims 7-12 stand rejected. The new limitations added to the claims do not overcome the rejections.

Regarding the new limitations, Taylor et al. shows supplying hexachlorodisilane and ammonia to a reaction vessel to form a silicon nitride film on a work piece. Mizuno et al. teaches that the exhaust pipe is necessarily present on Taylor et al. process (col. 5, lines 15-43). Mizuno et al. suggested discharging ammonia from the reaction vessel into the exhaust pipe after depositing the silicon nitride (col. 5, lines 45-67).

### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yamaga et al. (U.S. 5,484,484)(of record) teaches the exhaust pipe connected to the reaction vessel is conventional in the art. Tanaka et al. (U.S. 6,354,241) is cited as evidence to show that the formation of Si-N-H during deposition of silicon nitride is known in the art (col. 6, lines 60-67).


9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 571-272-1837.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Maria Guerrero  
Primary Examiner  
April 22, 2004